Porcupine.

agreement drafted solely for the purpose of conserving the moose population. During recent discussions between USARAK and ADF&G personnel, the fall population objective of 600 moose was reduced to 500 to minimize the potential for a high rate of mortality due to overbrowsing. Moose habitat preferences are shown in Figure 2-10.

Other Big Game Species: Other big game species occur on the post but are not hunted. These include grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*), and Dall sheep (*Ovis dalli*) (Quirk 1994).

Small Game and Furbearers: Small game and furbearers found on Fort Richardson include coyote (*Canis latrans*), wolf (*Canis lupus*), lynx (*Lynx canadensis*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), hoary marmot (*Marmota caligata*), marten (*Martes americana*), beaver (*Castor canadensis*), river otter (*Lutra canadensis*), wolverine (*Gulo gulo*), red fox (*Vulpes vulpes*), porcupine (*Erethizon dorsatum*), and mink (*Mustela vison*), Game species are included in Appendix F.

Cook and Seaton (1995) have prepared a *Checklist of the Mammals of Fort Richardson, Alaska*, which includes both confirmed and suspected species. The first post-wide small mammal survey was conducted in summer 1994 by the University of Alaska Museum. This survey used LCTA field plot locations as sampling locations. Results of the survey are included with the list of mammals currently known to occur on the post in Appendix F.

2.3.3.2 Birds

Several bird surveys on Fort Richardson have been conducted in recent years. Together, they provide a reasonably complete inventory of the species that use the post. A 1994 USFWS raptor inventory on Fort Richardson (Schempf 1995) discovered six different types of raptors: bald eagle, golden eagle, northern harrier, red-tailed hawk, Harlan's hawk (dark phase of red-tailed hawk), and sharp-shinned hawk. Although no goshawks were found during this inventory, they are known to inhabit the dense forested areas of the post.

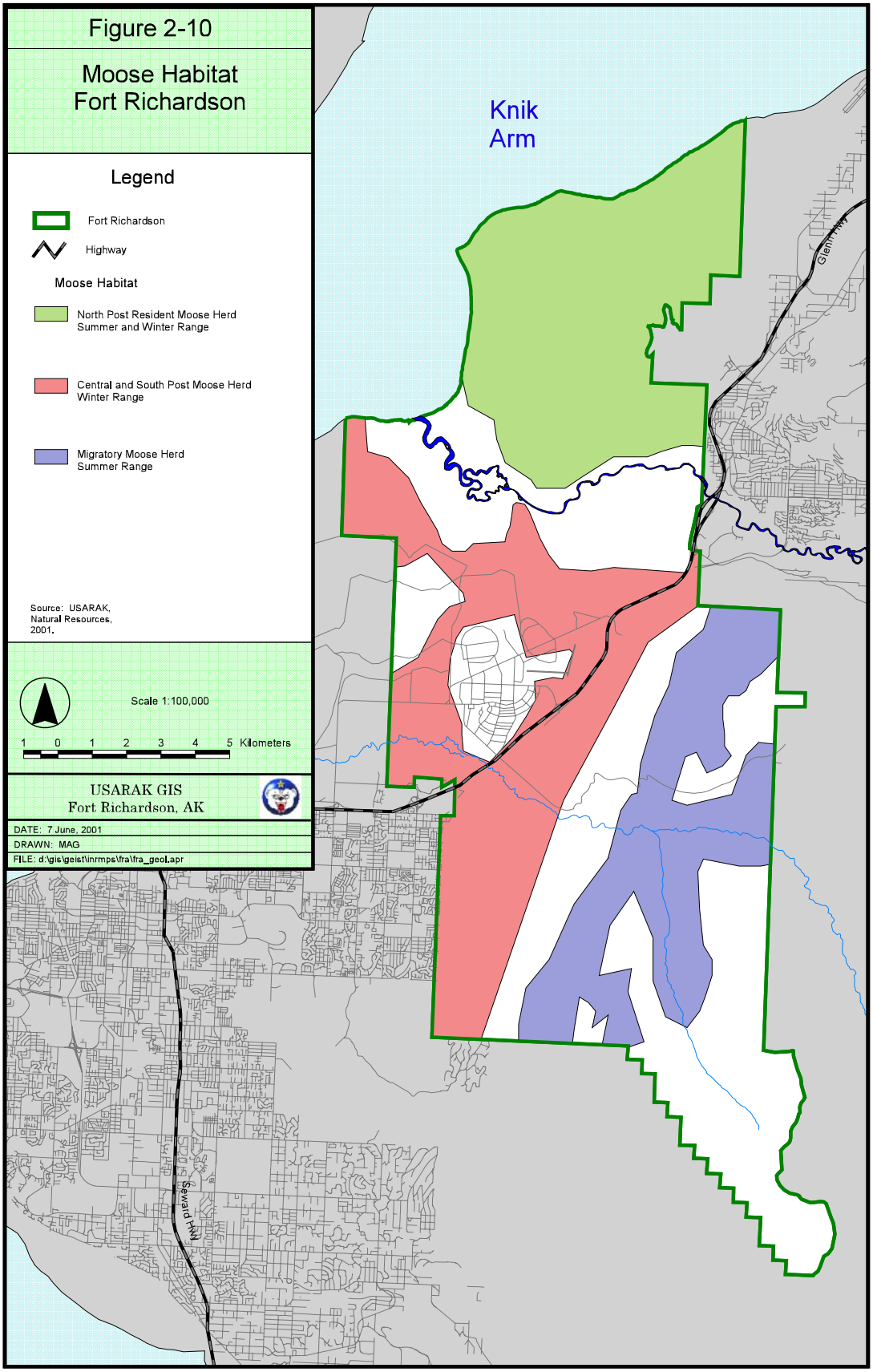
Game species include spruce grouse (*Dendragapus canadensis*), ptarmigan (*Lagopus* spp.), and numerous ducks and geese.

An intensive owl survey conducted by the USFWS in 1997 (Browne and Andres 1998) identified three species: great-horned, saw-whet, and boreal.

Since 1994, an ongoing inventory and monitoring of landbirds has been conducted in conjunction with LCTA, and the USFWS has also been assisting USARAK with bird surveys. This project adopts study methods endorsed by Partners in Flight and has the following goals: identifying avian habitats, conducting a breeding bird survey, establishing certain intensive study sites for neotropical birds modeled after Monitoring Avian Productivity and Survivorship (MAPS) stations, and compiling a post-wide bird checklist (Roush and Andres 1994). A total of 40 bird plots have been established in conjunction with LCTA, and two MAPS stations are currently being manned (Andres 1994). A progress report (Roush and Andres 1994) based on 341 hours of observation recorded 55 species.

Waterfowl and other birds associated with the ERF wetlands have been the most thoroughly documented avian species on the post. Inventories associated with intensive evaluations of ERF (CH2M Hill 1994b; Racine et al. 1993) have identified 75 avian species, including 24 species of waterfowl, occurring in the tidal salt marsh. These studies also

Figure 2-10. Fort Richardson Moose Habitat.



provided crucial information on avian habitat and behavior. Every field season since 1990, USARAK has conducted ground and aerial surveys of birds occurring in ERF, McVeigh Marsh, and post ponds and lakes (Fort Richardson 1994). These surveys are usually done from fixed-wing aircraft and focus particularly on determining the size of waterfowl populations (Quirk 1994). Refer to Appendix F for a complete list of bird species found on Fort Richardson.

2.3.3.3 Fish

Ten species of fish are found in post lakes and waterways. Fort Richardson is part of the Anchorage Area Management Unit for fisheries administered by the ADF&G. The ADF&G periodically stocks rainbow trout (*Oncorhynchus mykiss)*, landlocked salmon (*Oncorhynchus* spp.), Arctic grayling (*Thymallus arcticus*), and arctic char (*Salvelinus alpinus*) in the five managed lakes (ADF&G 1995) and maintains records of fish harvested from post streams and rivers. Species of game fish occurring in these waterways include silver salmon (*Oncorhynchus kisutch*), king salmon (*Oncorhynchus tshawytsha*), red salmon (*Oncorhynchus nerka*), chum salmon (*Oncorhynchus keta*), pink salmon (*Oncorhynchus gorbuscha*), and Dolly Varden (*Salvelinus malma*). Fort Richardson's only significant nongame fish are the three-spine stickleback (*Gasterosteus aculeatus*) and the slimy sculpin (*Cottus cognatus*). One other species recorded on Elmendorf AFB, and probably found on Fort Richardson, is the nine-spine stickleback (*Pungitius pungitius*) (Roth et al. 1983).

Gill-netting has been conducted occasionally in the five managed lakes to monitor fish populations since 1975 (Bennett 1982). Although these fish surveys are scheduled semi-annually for spring and fall, whether or not they take place is determined by the availability of personnel. The primary method for monitoring fish in rivers and streams is the annual angler harvest. A list of fish species known to occur on Fort Richardson is included in Appendix F.

2.3.3.4 Reptiles and Amphibians

No reptiles are known to occur on Fort Richardson. One species of amphibian, the wood frog (*Rana sylvatica*), is found on the post. The frog is common in bogs, freshwater and saltwater marshes, and lake margins. In ERF, it is an important prey species for migrating sandhill cranes (CH2M Hill 1994b).

2.3.3.5 Special Status Fauna

No federally listed threatened or endangered animals inhabit Fort Richardson. A delisted species,

Bald eagle.

Trumpeter swans.

Baluga whales in Eagle River.

the American peregrine falcon (*Falco peregrinus anatum*), is known to pass through the area. Though not found during the recent raptor inventory (Schempf 1995), it was recorded during field studies at ERF in May and August 1991-1992 (CH2M Hill 1994b). Another delisted species, the Arctic peregrine falcon (*Falco peregrinus tundrius*), has not been observed but could also potentially occur on Fort Richardson.

Another federally delisted species, the bald eagle (*Haliaeetus leucocephalus*), is common locally. Although its status does not apply in Alaska, it is afforded special protection by USARAK in accordance with the Bald Eagle Protection Act (Quirk et al. 1978). In the raptor inventory (Schempf 1995), bald eagles were the most frequently seen species.

Two other avian species, the trumpeter swan (*Cygnus buccinator*) and the golden eagle (*Aquila chrysaetos*), are of special concern for wildlife management on Fort Richardson. As the world's largest waterfowl species, the trumpeter swan is a migrant on Fort Richardson, stopping in ERF during both spring and fall migrations. The golden eagle is a resident of the alpine habitats of the post. (Quirk et al. 1978).

Within recent years, beluga whales (*Delphinapterus leucas*) have been sighted within ERF as far as 1¼ miles up the Eagle River. They have been observed chasing salmon up drainages along the river bank (Quirk 1994). These, as well as all whales in United States waters, are protected under the Marine Mammals Act.

2.3.4 Special Interest Management Areas

"Biologically or geographically significant or sensitive natural resources . . . shall be inventoried and managed to protect these resources, and to promote biodiversity . . ." [11]

Designation of special protection status for important or fragile natural areas is an effective management tool. In accordance with AR 200-3, areas that contain natural resources warranting special conservation efforts will be identified during the inventory and classification process. After appropriate study and coordination, such areas may be managed as "special interest areas" for their unique features. Per AR 200-3, this INRMP "will address the special management necessary for these areas, and all current and future land uses will consider the uniqueness of these areas and plan accordingly to ensure conservation of their resources."

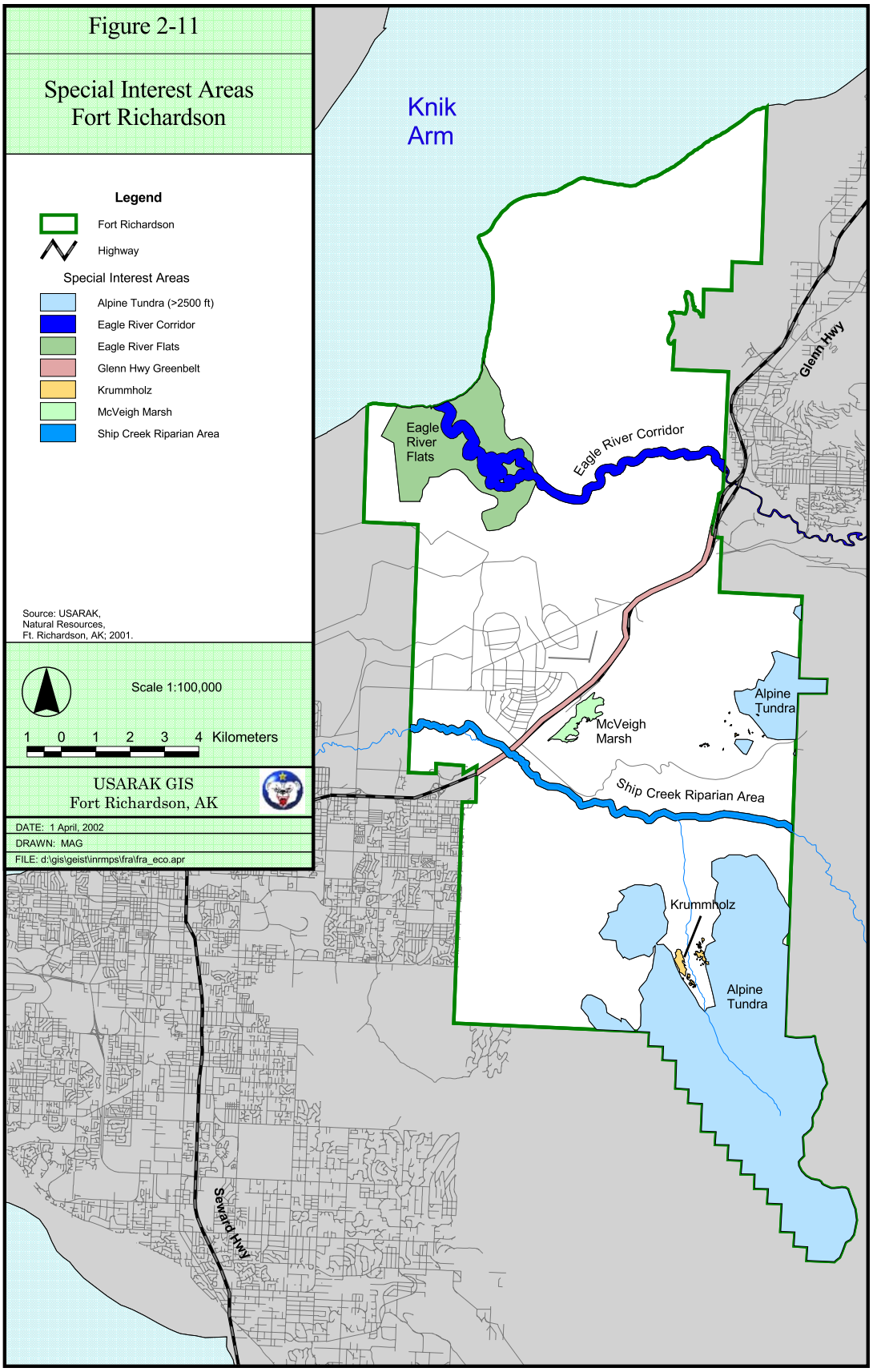
Fort Richardson has areas with special natural features. They harbor sensitive or unique wildlife species, represent unique plant communities, or possess unusual geologic or topographical characteristics. The following is a description of the currently identified special interest areas on Fort Richardson along with restrictions and stipulations for their use. Special interest areas on Fort Richardson are shown in Figure 2-11.

2.3.4.1 Old-Growth Forest

Old-growth forest near Waldon Lake.

[11] DOD Instruction 4715.3, Environmental Conservation Program.

Figure 2-11. Fort Richardson Special Interest Areas.



Surveying Fort Richardson's old-growth forest.

Old-growth forests are defined as ecosystems dominated by old trees and related structural features that are characteristic of later stages of successional development. They differ from earlier stages in structure, composition, and function (Kaufmann et al. 1992). In the Pacific Northwest, where most old-growth research and public attention has been focused, six attributes have been used to characterize old-growth forests: large trees; snags; large down woody material; multiple tree canopy layers; associated shrub, herb, and grass components; and canopy gaps (USDA Forest Service 1992). Old-growth attributes such as multiple canopy layers, large accumulations of dead and down trees, and multiple species are not found in all types of old-growth forests and can also be found in earlier stages of successional development (Kaufmann et al. 1992). Sites that do not have a full complement of old-forest characteristics can partially function as old forests for those attributes that are present. Viereck et al. (1992) pointed out that old-growth is not synonymous with old age and must be recognized on the basis of stand characteristics.

Primary tree species that compose old-growth on Fort Richardson are paper birch and white spruce. Birch is relatively short-lived (80-120 years), while white spruce is relatively long-lived (over 250 years). White spruce/paper birch is a recognized forest cover type in south-central Alaska, but it is considered to be a transitional stage that follows paper birch and precedes the white spruce type (Eyre 1980). Thus, old-growth in this region is very different from the Douglas fir/Sitka spruce/western hemlock forests of the Pacific Northwest and southeastern Alaska, which can attain ages of 500-700 years or more. For the purposes of this plan, old-growth on the post is tentatively defined as stands with the dominant trees being 150 to 200 years old. Trees of this age are rare on Fort Richardson due to fires that burned over much of the area in the 1920s and '30s. The spruce bark beetle has decimated much of the older spruce forest on the post as well.

Most of the old-growth forest type on Fort Richardson was thought to occur near Otter Lake, but other than that little was known. In 1995, a study was initiated to identify and characterize old-growth on the post. Results of the study will be used to determine management strategies that will be based on the total acreage identified as old-growth and will likely emphasize some degree of protection for these stands. It will be important to manage the entire forest ecosystem so that some older stands are allowed to mature into old-growth over time.

High quality groves of old-growth will be ideal for inclusion in the Watchable Wildlife program on Fort Richardson. Such special areas will be marked for protection from damage and identified in brochures indicating special places to visit on post (when compatible with troop training activities).

2.3.4.2 Krummholz

Beyond treeline, species usually considered as trees are so stunted that they are more like shrubs. These stunted trees are called krummholz, a descriptive German word meaning "elfin timber" or "crooked wood." Krummholz growth habit is shrubby and dense, becoming more prostrate, twisted and contorted with altitude. Treetops are flat or flagged or

Krummholz found in the subalpine areas of Fort Richardson.

Krummholz areas on Fort Richardson are dominated by mountain hemlock.

both; trunks are gnarled. Basal branches form impenetrable masses of long intertwined serpentines, impossible to walk through.

Any of the evergreen tree species of the subalpine forest may be represented in the krummholz. Since krummholz trees rarely produce seed, most seedlings sprout from seeds blown up from lower altitudes. They then become established in pockets of the subalpine regions that provide suitable microhabitats. Propagation of this unique vegetative community is most commonly carried out by "layering," the rooting of tree branches that come in contact with the soil. The erratic topiary shapes of krummholz represent the outer boundaries of a favorable microclimate that is circumscribed by cold temperatures and abrasive drying winds. Only the part of the krummholz covered by the snow pack escapes winter damage.

Single krummholz trees are stunted and seldom exceed 6-8 feet in height. Many of these trees are flagged, the top branches pruned back by the desiccating effect of winter wind. Only the leeward branches remain on the trunk, semi-protected by its mass, looking like arboreal wind socks. The age varies; some krummholz trees in Rocky Mountain National Park have been cored out to be over 300 years. The oldest tree was 390 years of age. When krummholz does become established, it dominates the microhabitat, out-competing many other subalpine plants. Many tundra creatures shelter near the krummholz, and many lower altitude plants are able to extend upward within its protection.

Fort Richardson has classic examples of krummholz vegetation communities in the subalpine regions. Infantry Flats is accessible by an all-weather road and a trail leads through the krummholz patches of evergreens. The dominant krummholz evergreen in the subalpine zone is mountain hemlock (*Tsuga mertensiana*). It grows in large patches of an acre or more in forest groves beyond the upper limits of the boreal forest. These groves may attain a height of 15 feet. Other krummholz evergreens are white spruce trees that grow as single trees, the top branches often flagged. One other evergreen species found growing in the subalpine region is juniper (*Juniperus communis*), which attains a height of about 3 feet. The juniper does not appear to be stunted nor is it twisted and gnarled.

2.3.4.3 Alpine Tundra

Alpine tundra is the most extensive, ecologically sensitive area on Fort Richardson. The area is shown on the vegetative map (see Figure 2-7). The major restriction imposed on this area is the prohibition of vehicular traffic off roads and trails indicated on the training map.

The alpine tundra is the most ecologically sensitive area on Fort Richardson.

2.3.4.4 Cultural Resource Areas

USARAK takes special measures to protect its cultural resources. An Integrated Cultural Resources Management Plan for Fort Richardson has been developed under separate cover. This plan will provide guidance for the inventory and evaluation of historic buildings and archaeological resources.

2.3.4.5 Ship Creek Riparian Area

Ship Creek and its riparian habitat are important and sensitive areas on Fort Richardson, requiring protection to maintain its health and natural function. Water quality on Ship Creek is of utmost importance because any deterioration on Army lands will affect downstream locations on Elmendorf AFB and in the city of Anchorage. USARAK's goal is to maintain Ship Creek in a condition as pristine as possible and to repair portions that may become damaged. Further development, beyond that already approved for the golf course expansion, will not occur in the riparian area. Tree cutting will be prohibited. Clearing for the golf course will be limited to that absolutely necessary for course construction. Troops and other authorized users will continue to have "pass through" access.

2.3.4.6 Eagle River Corridor

Approximately 8 miles of the glacially fed Eagle River pass through Fort Richardson. The river, characterized by a swift cold current with high sediment loads, supports native runs of all five species of Alaskan salmon. It is important for both military training and recreational activities. The river corridor on Fort Richardson varies between steep bluffs and low-lying wetlands. Besides Ship Creek, it is the only area on the installation with a substantial riparian ecosystem. It is USARAK's goal to maintain this corridor in a natural condition with the exception of some periodic construction activities at two bridge crossing sites.

Eagle River corridor varies between steep bluffs and low-lying wetlands.

2.3.4.7 Other Riparian Areas

There are other small riparian areas on Fort Richardson that require special protection. These areas include Fossil Creek and Clunie Creek. These areas are being identified, and they will be protected as required. Limiting military training and recreational activities provides some protective measures for riparian ecosystems.

2.3.4.8 Lakes

Major lakes are important to ecosystem integrity and outdoor recreation on Fort Richardson. Often, older forests are associated with these lakes. There are certain military activities that can occur on or near these lakes without significant damage to either natural processes or outdoor recreation opportunities. Section 6.2.4 describes the special considerations associated with these lakes and other recreational areas. All military activities planned for these lakes and their immediate surroundings will require approval from the Natural Resources Branch prior to implementation. Vehicular maneuvers or intensive bivouac operations will not be permitted in these areas without such approval. Dog training is prohibited at Fort Richardson's lakes, with the exception of Thompson Lake, Derby Pond, and Dishno Pond.

Some lakes are losing their pristine quality (e.g., Waldon Lake) due to abuse from users. The establishment of quality roads, parking areas, barricades, and trails will significantly improve the ability of natural resource managers to control the distribution of use.

2.3.4.9 Eagle River Flats

Eagle River Flats (ERF) is an important 2,136-acre coastal halophytic salt marsh on the Knik Arm of upper Cook Inlet, and it is the post's premier wetland. Lower Eagle River bisects the marsh. The marsh and associated shallow ponded areas are heavily used as a stop-over and feeding area for migrating waterfowl. Sensitive waterfowl species, such as trumpeter swans and snow and white-front geese, utilize the flats during migration periods in the spring and fall. Numerous research projects

have been conducted in ERF as a result of waterfowl poisoning from white phosphorus, a component of some Army munitions. Remedial studies and pilot treatments are being conducted and will continue into the future. As described previously, there are stringent restrictions on the use of ERF due to its history as an impact area and the continued presence of unexploded ordnance.

2.3.4.10 Other Wetlands

Wetlands protection is required by Executive Order 11990, *Protection of Wetlands.* NEPA is the process used to evaluate projects for wetlands impacts. Any uses of wetlands will be reviewed by the Natural Resources Branch. If necessary, the U.S. Army Corps of Engineers will be consulted to determine whether jurisdictional wetlands are involved. Wetlands management practices are discussed in Chapter 3.

Wetlands protection is mandated by Executive Order.

2.3.4.11 Glenn Highway Greenbelt

The 7 miles of the Glenn Highway that bisect Fort Richardson is an important scenic roadway in the Anchorage urban area. The area bordering Ship Creek and the Glenn Highway is excluded from most military training activities. The exclusion is needed to protect and maintain the visual barrier between the post and the heavily traveled thoroughfare.

USARAK's goal is to maintain the greenbelt in a condition as pristine as possible and to enhance portions of the greenbelt damaged by development. Where necessary, trees will be planted to screen developed areas, such as the machine gun range and the National Guard site. The Army is committed to protecting the aesthetics of natural forests along the Glenn Highway.

2.3.4.12 Other Special Interest Areas

Fort Richardson has other unique sites that qualify as special interest areas. Special consideration is afforded to areas described below when evaluating projects or activities that might negatively impact them.

2.3.4.12.1 McVeigh Marsh Waterfowl Refuge

McVeigh Marsh is a sensitive and important ecological area where large numbers of waterfowl nest and rear their young. Up to 10 species of waterfowl use McVeigh Marsh. Protection of waterfowl, wetlands, and hydrology are all important factors of consideration in management of McVeigh Marsh.

McVeigh Marsh.

2.3.4.12.2 Otter Lake and Otter Creek Wildlife and Recreation Area

The Otter Lake vicinity is an important nesting area for diverse waterfowl and songbird populations. The lake is also an important recreation area with overnight camping and day-use picnicking facilities. The lake is stocked with rainbow trout each summer and is an important military and Anchorage area sport fishery. Otter Creek supports important wildlife habitat for silver salmon (spawning and rearing), mink, and river otters.

Fishing on Gwen Lake.

2.3.4.12.3 Gwen Lake Wildlife and Recreation Area

Gwen Lake and vicinity includes three small lakes that are important wildlife habitats for beaver and waterfowl. Gwen Lake is also a day-use picnicking and tent camping area. The lake is stocked with rainbow trout and is an important sport fishery for military and civilians in the Anchorage area. Rainbow trout feed on a rich freshwater shrimp resource and display growth rates in summer that are unrivaled in south-central Alaska.

2.3.4.12.4 Clunie Lake Wildlife and Recreation Area

Clunie Lake is known for its nesting loons. Protection of remaining habitat for these sensitive waterbirds is of primary importance as human disturbance throughout the Anchorage area is causing significant reductions in their numbers and former territory. Clunie Lake is a designated day-use picnicking and camping area. It also is a sport fishery for military and Anchorage area users, with rainbow trout being stocked annually.

Clunie Lake is known for its nesting loons.

2.3.4.12.5 Waldon Lake Wildlife and Recreation Area

Waldon Lake is another lake used by loons. It also is a sport fishery and stocked with rainbow trout and other species of fish each summer.

2.3.4.12.6 North Fork Campbell Creek Anadromous Fish Stream

The North Fork of Campbell Creek on Fort Richardson is a spawning and rearing area for king salmon. High water quality and low disturbance to spawning grounds must be maintained. Permits are required for any activity that may affect the anadromous features of this creek.

2.3.4.12.7 Chester Creek Anadromous Fish Stream

Chester Creek on Fort Richardson is a spawning and rearing area for silver salmon. High water quality and low disturbance to spawning grounds must be maintained. Permits are required for any activity that may potentially affect the anadromous nature of this creek.

2.4 Cultural Resources

Much of Fort Richardson has not been surveyed for cultural and historic resources. Generally, surveys have been site specific (e.g., Glenn Highway, Malemute Drop Zone, Snowhawk Lake, and Otter Lake) with the exception of Steele (1980) who conducted a low intensity archaeological survey of the entire post. The following information, with exception of Site Summit material, is from Bacon et al. (1986).

Only a relatively small portion of Fort Richardson is considered to be highly sensitive with regard to archaeological resources. These areas include the mouth of Eagle River, the shoreline of Knik Arm, upstream portions of the Ship Creek drainage, the Fossil Creek drainage, Elmendorf Moraine, the 40-90mm Range, and Grezelka Range. The rest of the post is not considered sensitive.

Historically, the Anchorage area may have been inhabited intermittently for 9,000-10,000 years, although few sites associated with this early occupation have been found. Pacific Eskimos probably occupied the area, at least seasonally, as recently as 300 years ago. The Tanaina Athabaskan Natives initially occupied the area between 1650 and 1780, and there were several Tanaina villages in the Fort Richardson area. Eklutna is the only village still in existence. Most archeological sites on Fort Richardson were probably summer fish camps. It is possible that Russian artifacts could be located on Fort Richardson due to early Russian influence in the Kenai Peninsula and the Interior. A portion of the Iditarod Trail is on Army lands, although its exact location has not been pinpointed.

The seven known cultural resources sites (not including Site Summit) on Fort Richardson are all historic and adds only a few details to the already large body of knowledge on the history of Anchorage. The value of future archeological surveys on Fort Richardson lies in discovering new sites of varying time periods and cultural affiliations. It is likely that such sites exist. Bacon et al. (1986) indicates a priority for future archeological surveys. High priorities include Otter Lake, Gwen Lake, Clunie Lake, the mouth of Eagle River, and streams emptying into Knik Arm, which have not been surveyed, as well as searching for the Iditarod Trail near Otter Lake Recreation Area.

The abandoned Nike Hercules Missile Battery on Site Summit is an important Cold War historic property. It is the only remaining Nike site of the eight built in Alaska that still maintains its historic character as a functional missile battery. It was the last Nike Battery in the nation to be deactivated, in 1979.

A Legacy Resource Management Program grant by the Department of Defense funded a study to inventory, evaluate, develop interpretative materials, and nominate the Nike Hercules Missile Battery at Site Summit to the National Register of Historic Places. This work was completed and the Nike Site was listed by the Keeper of the National Park Service on July 8, 1996.

Phase II of the Legacy grant for the Nike Site provided funding to develop a feasibility study for the management of a Cold War Nike Hercules Missile site. The study was completed in December 1997. Recommendations in the study will be used in developing the Fort Richardson Cultural Resources Management Plan.

Only 15 miles from downtown Anchorage, Site Summit rises about 4,000 feet above sea level, providing an incredible scenic view of Anchorage, the Susitna and Cook Inlet basins, and surrounding mountains. It has high potential for being a world class historic and recreational area, offering insights into both the Cold War and alpine tundra. Site Summit is further described in a pamphlet prepared by the Alaska Office of History and Archeology (1996).